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CANCER FOUND INFECTIOUS DISEASE OF BLOOD CELLS RUN WILD

Two facts about the fundamental nature of malignant tumor, which may bring nearer the conquest of cancer in man, have been discovered by Mrs. Margaret R. Lewis, Carnegie Institution anatomist, and Howard B. Andervont, Johns Hopkins graduate student, conducting joint research.

First, they have found that, for one form in the chicken at least, cancer is a mass of white blood cells or corpuscles. White blood cells desert their normal function of being the soldiers of the body that repulse invading germs and poison, and, instead, run wild, multiply, and gorge themselves until they form the mass of the malignant tumor. Heretofore the nature and exact origin of the cancerous mass has been unknown.

Second, the investigators have discovered that cancer can be transmitted simply by injecting into the muscles of a well chicken either the blood plasma or the white blood cells of a chicken suffering from cancer. Not only is the simple inoculation by transplanted blood successful, but serial inoculations by means of blood have been continued through as many as four generations of malignant tumors. This is evidence of the infectious nature of cancer, for, while heretofore it has been demonstrated that portions of cancerous tissue when transplanted will produce cancer in another animal, it was not known that one could thus transmit the infectious virus repeatedly from animal to animal by means of either the blood plasma or the white blood cells.

Mrs. Lewis and Mr. Andervont content themselves with stating the simple experimental facts of their investigations which were conducted in the Laboratory of Embryology of the Carnegie Institution of Washington located in Baltimore. But it is to be expected that their facts will be eagerly applied to cancer research now being pursued intensively in all parts of the world. Their discovery was announced to the scientific world in two preliminary technical papers in the Anatomical Record for March 25.

One of the kinds of cancer used in the experiments was the famous Rous chicken sarcoma. Dr. Peyton Rous at the Rockefeller Institute of Medical Research proved this tumor could be transmitted not only by actual transplantation of its portions but also that normal cells could be stimulated to malignancy by the mere filtrate from the tumor. Now this tumor and also a chemically produced cancer, Carrel's indol sarcoma, have been found by Mrs. Lewis and Mr. Andervont to consist essentially of white blood corpuscles and to be transmitted by inoculations of white blood cells or plasma.

Neither of these two cancers are exactly the same as those found in man. The term "cancer" is very similar to the term "fever" in that it is the general name of a large number of different diseases. But the chicken cancers studied are similar to some disturbances of the lymphatic and circulatory systems in man, such as enlarged spleens, and other blood glands, that consist essentially of large masses of white blood cells, gone bad. It is believed that the same general principles that govern chicken cancer are likely to apply to human cancers, even of the usual carcinoma or epithelial type, and that therefore through the study of chicken cancer human cancers may be better understood. Tumors can be produced in a large variety of ways. Seven different bacteria, two types of parasites, various chemicals such as coal tar derivatives, and viruses, when injected into animals will each produce malignant growths.

Fully as important as their discovery of the identity of cancer cells with white blood cells, is the discovery that the infectious agent of cancer is carried in the white cells and in the liquid or watery portion of the blood of a chicken suffering from tumor. The infectious nature of cancer itself has been very much debated, and the fact that Mrs. Lewis and Mr. Andervont have demonstrated that the plasma of tumorous chickens produces cancer in 75 per cent, of the inoculations and that the white blood cells produce cancer in 95 per cent. of the attempts is startling evidence. Transplants of the cancer tissue produce 100 per cent. results. The conception that cancer is caused by a virus of some sort, perhaps a micro-organism too small to be seen through the most powerful microscopes, may thus be supported. The fact that cancer can be transmitted from one animal to another by these methods, serially time after time, is evidence that the infective agent reproduces itself or is regenerated by the host.

"The active tumor producing agent must increase greatly," said Mrs. Lewis, "for it is just as active in producing a tumor after it has been passed through a series of as many as four chickens, i.e., taking the blood from one chicken, inoculating this into another, waiting until the second chicken had formed a tumor at the site of the inoculation, then taking a little of the blood from this chicken and inoculating this into a third chicken, and so on until this has been carried as far as the fifth chicken. This discovery places the chicken tumor on the same basis as certain other diseases which are capable of being transmitted by the blood. This fifth passage of the tumor by means of the blood results in just as malignant a tumor, in fact often much more so than the original tumor. This is an entirely new point of view."

Cancer research is not the primary object of Mrs. Lewis' scientific work. She is an authority on cells and with her husband, Dr. Warren H. Lewis, also of the Carnegie Institution's Department of Embryology, she has made many significant contributions to our knowledge of the blood cells. Mr. Andervont is on the staff of the department of filterable viruses of the School of Hygiene and Public Health of Johns Hopkins University.

The first state to establish a state university was Georgia.

Seven radiobeacons have been established on the Great Lakes.

NEW GERMAN EXPERIMENTS CONFIRM EINSTEIN THEORY

Failure to find any evidence of the motion of the earth through the ether which is supposed to pervade all space, and thus to confirm the recent work of Dr. Dayton C. Miller, at the Mt. Wilson Observatory in California, is announced by Dr. Rudolph Tomaschek, of the University of Heidelberg, in the "Annalen der Physik."

Dr. Miller, who is professor of physics at the Case School of Applied Science at Cleveland, repeated the Michelson-Morley experiment on Mt. Wilson, 6000 feet above sea level. This experiment measures the difference in the time taken by two beams of light to travel in two paths at right angles to each other. While a negligible effect was obtained when it was performed at Cleveland, the Mt. Wilson results showed what was apparently a drift through the ether, because the light beam travelling in the direction of the supposed ether drift took longer to return to the starting point than the one going at right angles to it.

Dr. Tomaschek has repeated two other experiments designed to test the ether drift, both of which use a charged condenser, somewhat similar to the condensers used in radio receiving apparatus. In the first one he sought to observe the magnetic field which should be produced by the motion of such a condenser through the ether, but none was observed, even though it was performed at altitudes of 65 feet, 1850 feet and 11,400 feet, the latter being on the Jungfrau, one of the highest peaks in the Alps.

The other experiment was one originally performed in England by Prof. F. T. Trouton and H. R. Noble, of the University of London, in 1903. This consisted in suspending a light disc-shaped condenser, also electrically charged, by a fine wire, so that it was free to turn. If the ether is drifting by, the condenser would tend to hang at right angles to the direction of the drift, so the experimenters hung it with its plane in the direction of the supposed motion through the ether, and sought to observe the slight turning of the condenser.

No such turning was observed by the original experimenters, or by Dr. Tomaschek at any of the altitudes, although his apparatus was sufficiently delicate to detect a relative motion of the ether and the earth much smaller than that indicated by Dr. Miller's results. As the Einstein theory of relativity was based partly on the fact that no such ether drift could be observed, and as Prof. Miller's work has been said by some authorities to necessitate a considerable modification of the relativity theory, Dr. Tomaschek's work is taken as evidence in its favor.

GOVERNMENT PERFECTS SYSTEM TO MAKE UNBREAKABLE GLAZE

Housewives and incidentally the whole ceramic industry need no longer suffer great losses in temper and in money from the cracking of the glaze on kitchen pots and pans. Experts at the U. S. Bureau of Standards have developed a system of measuring the rate of expansion of the glaze used on pottery and enameled ware that will help manufacturers in making a product, the surface of which will not crack.

All glazed ware consists of a body of clay or metal covered with a thin glassy layer having a composition quite different from that of the base. Those

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two different materials expand at different rates when heated. Thus there is considerable strain when the glazed object contracts on cooling down from its firing in the furnace. The strains suffered by this brittle glaze, only one two-hundredth of an inch thick, during the annealing process, reduce its resistance to the many stresses it must endure in the course of a more or less hazardous existence in the kitchen sink and on the dining room table.

Manufacturers, keenly alive to the vital bearing of these facts on the development of their industry, have contributed generously to scientific research on this problem in university laboratories, hitherto without avail.

In a long series of experiments, in which the exact conditions of manufacture were reproduced, C. G. Peters and G. E. Merritt of the interferometric section of the Bureau of Standards have perfected a system for measuring the rate of contraction and expansion of the different glazes in commercial use. By applying this general method to their individual problems, manufacturers of every variety of glazed ware, from bricabrac to bathtubs, will be able to ascertain their errors. They can then turn out products the surfaces of which do not "craze" either in the making or subsequently, with consequent saving to both producer and consumer.

FATNESS MAY BE HEREDITARY

The fat person who is active in habits and frugal in his diet is the one who furnishes the real problem in obesity, authorities say. Does the fat one carry out his fundamental exchange of energy more economically, with a large surplus of energy producing heat in the form of fat left over? Dr. Solomon Strouse of Chicago and his collaborators in a study of basal metabolism say that fat people conserve the body fat and thus acquire a surplus while the thin use up thier food fat instead of storing it.

Since it has been established that the rate of metabolism, or exchange of food into energy, of the obese is normal, some physiologists have tried to account for the surplus of fat on the grounds of heredity. Dr. C. B. Davenport divides the population into three elementary species, called biotypes, characterized by their build, slender, medium, and--fleshy. In some families only one type is involved, in otherstwo or more. In some cases the variation may be due to the idiosyncrasies of the endocrine glands or to constitutional and cultural factors in the manner of living.

As one authority has remarked, the large amount of public interest in obesity is in marked contrast to the small amount of scientific information. We do not yet really know why the fat are fat.

Country people in many parts of England still believe in witches.

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Country people in many parts of England [illegible]

SHOW BRASS TO BE RADIOACTIVE

Common brass is radioactive matter, according to Dr. Robert A. Millikan, director of the Norman Bridge Laboratory of Physics of the California Institute of Technology, in a statement following recent scientific experiments conducted in brass apparatus placed several fathoms deep in alpine lake waters. This conclusion comes as a by-product of the epochal discoveries of the activities of high-frequency cosmic rays. Incidentally, Dr. Millikan suspects that all matter is capable of spontaneous breakdown, or radioactive decomposition, though evidence in most cases is naturally lacking.

By immersing electroscopes shielded by brass and zinc containers, far down in the icy waters of Muir Lake in the high Sierras, Dr. Millikan was able to shut out even the highly penetrant cosmic rays then under observation. In spite of the reasonable assurance that the lake water, which is merely pure melted snow, contained no radium, it was found that the electroscopes were slowly discharged, showing that both the copper and the zinc in the instruments were slowly disintegrating at a rate fast enough to emit electromagnetic energy in the form needed to effect the electroscope.

Radioactivity - or the transformation of matter into a new species of matter plus new energy - has been considered a special prerogative of a few freak elements, notably radium, uranium and thorium. It now appears probable that the whole gamut of elements carries such possibilities within one grand system of evolution of matter.

CADMIUM PLATING PROTECTS STEEL

Cadium plating is as effective in preserving iron and steel from corrosion as zinc, metallurgists at the U. S. Bureau of Standards find.

Zinc plating or "electrogalvanizing" is especially valuable in commercial processes because it continues to act as a protection to the underlying iron or steel even when partially worn away. This is the result of an electro-chemical reaction between the base metal and the coating. The two in contact with a liquid such as a water solution of any chemical salt act like a wet battery. Automobile parts subject to corrosion, such as rims, nuts and bolts, are common examples of electrogalvanized iron.

Cadmium has been suggested for use in this way but it was not previously known just how it would react. The experiments carried out in the metallurgical division by H. S. Rawdon have demonstrated that it behaves in much the same way as zinc, with some advantages and some drawbacks.

It is less readily attacked by air and moisture and in consequence stays bright longer than zinc. It could suitably replace nickel plating in many places and it would give much more lasting protection to the iron or steel base. Likewise a coating of cadmium will last longer than a coating of zinc of the same thickness. It has, however, the serious disadvantage of being expensive to prepare. It is possible that it may be made more cheaply if the demand is ever sufficient to stimulate large quantity production.

TRANSATLANTIC HOUSE TO HOUSE RADIOTELEPHONY ACHIEVED

Conversation between people in their homes in and near New York and Boston, and people in their homes in London is the latest achievement of the American Telephone and Telegraph Company, which recently succeeded in carrying on a two-way conversation with London for the first time.

Previous tests have been from the long distance station of the telephone company in New York, with the voice carried over land wires to Rocky Point, Long Island, thence by radio to England, while the other end of the conversation came from England to Houlton, Maine, by radio and was then relayed over telephone lines by way of Boston to New York.

In the latest tests officials of the telephone company at their homes around New York and Boston, were connected by the regular telephone lines to the radio stations used in the transmission and receiving, while the people in London were connected through the central exchange there. At both ends, the ordinary types of telephone instruments were used.

WORKERS WITH UNPLANNED CAREERS RESTLESS, SURVEY SHOWS

The importance of charting out a definite course for a vocational career and then steering by it is shown by a survey of office workers who applied for jobs at a typical employment bureau. Results of the survey, just reported by Dr. Harry D. Kitson, of Columbia University, show the educational and job histories of 684 applicants for work.

The most striking fact discovered was that 40 per cent. of the men and 12 per cent. of the women were dissatisfied with their choice of occupation and wanted to change to other fields of work.

Dr. Kitson states that the histories of such workers as these, none of whom had had guidance in selecting or planning their careers, constitute a plea for educational and vocational guidance.

WASHED ANIMAL BLOOD MAY SAVE HUMAN LIVES

Important experiments on blood transfusion, made by Prof. Yourevitch and Mlle. Teleguina of Prague, appear to lead to the conclusion that special human blood donors will no longer be required in cases where transfusion is necessary to save a patient's life. The blood of a sheep or a cow might serve the same purpose, and special preparations of solution could be made in advance, and kept in bottles until required.

It has long been known that the most important point about blood in regard to transfusion is its specificity. That is to say, a rabbit can only be saved by the

injection of the blood of another rabbit. If the blood of a different animal is injected into its tissues, it dies immediately. In the case of human beings, blood has been divided into four groups. When an injection has to be made, the blood of the patient has first to be tested to see which group he belongs to. Only rare individuals of the fourth group can give blood to any of the others with beneficial and not dangerous results.

Prof. Yourevitch and his woman colleague have opened up an entirely new line of treatment. They separated the red blood corpuscles from the serum by centrifuging methods. They found that the poisonous qualities which on injection have such harmful effects are in the plasma, and that if the separation or "washing" is thoroughly carried out, the red blood corpuscles of an animal of one species can be injected into another without the slightest danger, but, on the contrary, with complete satisfactory results.

Rabbits which had lost an absolutely fatal quantity of blood could be saved by the injection of sheep's blood which would have been highly poisonous to them, provided only the washed red corpuscles were injected.

A rabbit which had received 10 to 15 cubic centimeters of unwashed ox blood died within five or six minutes. Another rabbit was given similar blood which had been partially washed, added to some of its own. After a period of serious prostration, it recovered. But a rabbit which had received only the red blood corpuscles of ox blood, which had been thoroughly washed, recovered completely without any detrimental symptoms.

It is confidently suggested by the investigators that in cases where human blood of the right group is not immediately available for transfusion, blood of any other group would be equally beneficial, provided only the washed red corpuscles were used. They also indicate that in their opinion blood of animals could probably be used in the same manner, if no human blood could be obtained.

It is further stated that a preparation of red blood corpuscles in a salt solution has been kept perfectly in bottles, and that there is no reason why such a preparation could not be made up in a standard manner, and stocked for use according to necessity.

AMERICAN WHEAT DISEASE TRACED TO RUSSIAN SOURCE

Wheat from southern Russia, brought to the United States for the purpose of pushing the wheat line west into the dry plains of Kansas and the Dakotas, smuggled in with it a troublesome disease known as "black chaff", according to report by Dr. Erwin F. Smith, which appeared recently in "Science."

The disease, which is of bacterial origin and manifests itself by a darkening of the husks and beards of the wheat, appeared in the wheatfields of the West several years ago. Nobody knew whence it had come, but since it grew in the hard-wheat area, most of whose grain was of recent Russian ancestry, Dr. Smith put forth the opinion that it had come in with the seed wheat. Recently his opinion has been confirmed, for the same disease has been found in a number of places in

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the great wheat lands just north of the Black Sea, where Mark Alfred Carleton gathered seed wheat for the U. S. Department of Agriculture nearly thirty years ago.

Dr. Smith, however, does not attach any blame to the work of this explorer, but believes that new plants should be grown under quarantine when first brought to this country, so that lurking diseases may be detected and excluded. Of Mr. Carleton's work he says:

"I have always considered Mr. Carleton's work to be the most far-reaching and practical piece of work ever done by the Bureau of Plant Industry, since in a district in our west stretching from Texas to North Dakota and covering several degrees of longitude, through his energy and ability, we now grow annually 100,000,000 bushels of the Russian hard wheats, where previously we did not grow any.

"I write this not to condemn Mr. Carleton but only to point out that, if our government were as intelligent as it ought to be (few governments have much foresight), we should now have agents scouring the whole world studying all sorts of crops and crop diseases so that in future when we import valuable ornamental plants and food plants we may do so without at the same time bringing in their parasites. Had we known of this Russian wheat disease in 1889 weshould have imported the Russian hard wheats more slowly and grown the plants in quarantine first and so have avoided introducing the parasite along with the grain. In similar ways we might have avoided the introduction of a dozen very destructive parastics which have come to us from the old world in the last three decades. The United States, even at the present time, is very derelict in making explorations in foreign countries for the benefit of its citizens and the conservation of its industries, but if we would lead the world we must change our policy. Japan is the only country thoroughly awake to the need of foreign exploration. Her scholars are in every quarter of the globe, dozens of them picking up every grain of information possible for use in the mother country. It is much to be regretted that we have not already adopted the same far-sighted and commendable policy."

TUBERCULOSIS VACCINATION MAY BE POSSIBLE IN FUTURE

Will our descendants be vaccinated for tuberculosis much as we now are for smallpox? That even the most conservative in the medical world do not consider such a future development impossible is shown by the editorial attitude of the Journal of the American Medical Association.

Discussion of the most recent results of the tuberculosis inoculation experiments of Prof. Albert Calmette of the Pasteur Institute, contrasts his methods with those of a German experimenter in this field, Dr. H. Selter, of the medical faculty of the University of Konigsberg. Attenuation of a disease germ to such a degree that it will confer immunity but will not cause serious illness has been the aim of many investigators for many diseases. Prof. Calmette and his associates believe that they have attained such a weakened strain of bacilli, by growing them for thirteen years in a medium consisting exclusively of bile.

Some 4,517 children have been vaccinated by Prof. Calmette since June, 1924. While detailed reports on all these cases are not quite ready for publication the following editorial comment is significant: "The vaccinated children all come from an environment in which open tuberculosis close at hand made natural infection seemingly inevitable. The records for 423 infants for the first six months after vaccination have been published. Approximately one-third of these children have been exposed within the family. In not one of them has a death occurred from recognized tuberculosis, although thirty have died from other causes. Calmette and his associates have compiled figures showing a mortality of 24 per cent. in three years for non-vaccinated children of tuberculous parents living under the same conditions."

Almost simultaneously with the last published account of Prof. Calmette's results, Dr. Selter makes the announcement through a German journal, the editorial continues, that to confer real immunity virulent living bacilli should be used for inoculation. In accordance with this theory he has vaccinated nine children with virulent tuberculous cultures, none of whom seem to have suffered any ill effects.

As in the French experiment, Dr. Selter used only children free from previous infection but exposed to tuberculosis in their home surroundings. Drastic as introduction of virulent tuberculosis bacilli into the system sounds, he felt that the trial was well grounded on animal experimentation and that the method had proved itself harmless. In no case did the children suffer any impairment to their general health. He is careful to state that he does not think his method will replace natural acquired immunity but he recommends that it be considered as an aid to infants who have to live in a tuberculous environment.

While the efforts of these European workers merit the close attention they are receiving, the editorial concludes with the warning that strains of tuberculosis bacilli vary greatly in strength since the occasional serious infection of animals following inoculation with supposedly attenuated strains of bacteria only shows that many factors are still unknown.

DEEP-SEA INKFISH SHOOTS LIGHT, NOT INK

A cuttlefish that confounds its enemies with light instead of darkness is the interesting creature described by Prof. E. Newton Harvey, student of what is popularly known as "cold light", who has just returned to Princeton University after eight months of research in the marine laboratories of Naples and Messina, Italy.

Ordinary squid or inkfish that live near the surface escape their pursuers by throwing out a cloud of black fluid, as a kind of submarine smoke-screen, Prof. Harvey explained. This abyssal form, which lives at depths of probably 10,000 feet, where no light ever penetrates, has only a rudimentary ink-sac, which instead of the usual inky sepia contains a luminous substance. When disturbed, it discharges a jet of this luminous material, and thus blinds its enemy with light instead of darkness.

Prof. Harvey is of the opinion that this deep-sea squid is a descendant of surface-living animals, but that as it evolved in darkness it found that this

reversal of its ancestral mode of defense was useful in insuring its survival.

TABLOID BOOK REVIEW

AN INTRODUCTION TO EARTH HISTORY. By Harvey Woodburn Shimer, Boston: Ginn and Company. 1925. $3.00.

There is such a vast lot of facts that a student is usually supposed to get in a first course in geology that the net result all toofrequently is a bad case of mental indigestion, leaving, in after years, a very confused notion of the facts and none whatever of the underlying meanings of them. Dr. Shimer judiciously selects out the more important of the facts to make a somewhat smaller dishful, and what is much more profitable, so concocts and arranges them that they are not only tastier on the table but should not prove difficult even to the most delicate of sophomore digestions. They thus have a good chance of being properly assimilated, and of becoming a real and lasting part of the mental tissues. Textbooks *are* getting better; and this one is a good sample of the new order.

TEACHING SCIENCE IN THE SCHOOLS, By Elliot Rowland Downing. The University of Chicago Press, Chicago, 1925. 185pp., $2.00.

THE TEACHING OF SCIENCE AND THE SCIENCE TEACHER, By Herbert Brownell and Frank B. Wade. The Century Co., New York, 1925. 322 pp., $2.00.

Despite the anti-scientific legislation which has handicapped the schools in some parts of the country, science in general probably has a more important place in the school curricula than ever before. In Prof. Downing's book he discusses the history of science teaching and its bearing on present day problems of the science teacher, the aims of science teaching and the way the problems are met in other countries. The discussion of the entire social and economic background, of the subject should help many a teacher to a better understanding of his mission in life.

The book by Messrs. Brownell and Wade is more in the nature of a manual for the science teacher - a fact indicated by some of the chapter headings, as "Laboratory Arrangement and Equipment", "Class Management", "Use of Projects", etc., although in the second part, such subjects as "The Science Teacher and the Community" are discussed. In many ways it supplements Prof. Downing's book and the two should be in the library of every science teacher.

Americans ate more ice cream in 1925 than in any previous year.
